

WHAT IS CLAIMED IS:

1. A chromatography stand for supporting a chromatographic column in use for chromatographic separation, the stand comprising:

5 first and second platens adapted to receive and hold the chromatographic column therebetween;

a frame mounting the first and second platens in generally opposed relation and for relative movement toward and away from each other;

10 at least one of the first and second platens being constructed for plug-in connection to the chromatographic column such that the column is positively located relative to the platens and placed in fluid connection through said at least one platen.

2. A chromatography stand as set forth in claim 1 wherein said at least one platen is sized and shaped to engage an exterior surface of the chromatographic column.

3. A chromatography stand as set forth in claim 2 wherein said at least one platen comprises a guide plate removably attached to the platen.

4. A chromatography stand as set forth in claim 3 wherein said guide plate is adapted for secure contact with said chromatographic column.

5. A chromatography stand as set forth in claim 4 wherein said guide plate has a recess for receiving an exterior surface of the chromatographic column.

6. A chromatography stand as set forth in claim 1 wherein said at least one platen is adapted to locate and make fluid connection with the column free of any fixed connection with the column.

7. A chromatography stand as set forth in claim 6 wherein both of the first and second platens are constructed for plug-in connection to the chromatographic column on opposite ends of the column such that the column is positively located relative to the platens and placed in fluid connection through both the first and second platens.

8. A chromatography stand as set forth in claim 1 wherein said at least one platen is formed with a nipple adapted for plugging into an opening in the chromatographic column to make a fluid connection with the column upon said plug-in connection of said at least one platen to the column.

9. A chromatography stand as set forth in claim 8 wherein the nipple projects outwardly from said at least one platen toward the other one of the first and second platens.

10. A chromatography stand as set forth in claim 9 wherein the nipple is movable relative to said at least one platen.

11. A chromatography stand as set forth in claim 10 wherein the nipple is resiliently biased outward from said at least one platen.

12. A chromatography stand as set forth in claim 11 wherein said at least one platen has a locator thereon for locating the column upon relative movement of said at least one platen and column into engagement with each other.

13. A chromatography stand as set forth in claim 12 wherein the locator comprises a recess in said one platen formed to receive a mating portion of the chromatography column.

14. A chromatography stand as set forth in claim 13 wherein both of the first and second platens are constructed for plug-in connection to the chromatographic column on opposite ends of the column such that the column is positively located relative to the platens and placed in fluid connection through both the first and second platens, each platen having a respective nipple and recess.

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15. A chromatography stand as set forth in claim 14 in combination with the chromatographic column having the mating portions receivable in the recesses.

16. A chromatography stand as set forth in claim 1 wherein said at least one platen has a locator thereon for locating the column upon relative movement of said at least one platen and column into engagement with each other.

17. A chromatography stand as set forth in claim 16 wherein the locator comprises a recess formed to receive a mating portion of the chromatography column.

18. A chromatography stand as set forth in claim 1 further comprising an actuator adapted for moving at least one of the first and second platens toward the other of the first and second platens, the actuator being capable of a coarse movement for rapid relative movement of the first and second platens and fine movement for small scale relative movement of the first and second platens.

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19. A chromatography stand as set forth in claim 18 wherein the actuator comprises a shaft capable of translation for the coarse movement and rotation for the fine movement.

20. A chromatography stand as set forth in claim 19 wherein the actuator includes a cam mounted on the shaft and a cam follower operatively connected to said one platen, the cam engaging and pushing the cam follower upon translation of the actuator shaft.

21. A chromatography stand as set forth in claim 19 wherein the cam engages and advances the cam follower upon rotation of the actuator shaft.

22. A chromatography stand as set forth in claim 21 wherein the cam and cam follower are configured for self locking engagement.

23. A chromatography stand as set forth in claim 1 in combination with the chromatographic column.

24. A chromatography stand as set forth in claim 23 wherein said chromatographic column is a chromatography cartridge.

25. A chromatography stand as set forth in claim 1 in combination with a plurality of chromatographic columns, at least some of the columns having at least one of a different length and a different diameter.

26. A chromatography stand as set forth in claim 1 in combination with a flushing connector adapted for plug-in connection to the first and second platens at the same time for passage of a flushing fluid through the stand to clean the stand.

27. A chromatography cartridge for use in a chromatography stand comprising:

a tube for containing chromatography media,
an end cap defining a closed end of the tube, the end cap having an inner face

received in the tube and an outer face for connection to said chromatography stand,
the outer face having a connector portion formed therein adapted for plug-in
connection to allow fluid communication with the interior of the tube.

28. The chromatography cartridge as set forth in claim 27 wherein said
connector portion is adapted to locate the tube upon said plug-in connection.

29. The chromatography cartridge as set forth in claim 27 wherein said
connector portion projects axially outward from the end of the tube.

30. The chromatography cartridge as set forth in claim 29 wherein the
connector portion is a cylindrical projection.

31. The chromatography cartridge as set forth in claim 30 wherein the
connector portion has a diameter of approximately 25 millimeters.

32. The chromatography cartridge as set forth in claim 29 wherein the
connector portion projects axially outward from the end of the tube by a distance of at least
about 1 millimeters.

33. The chromatography cartridge as set forth in claim 32 wherein the
connector portion projects axially outward from the end of the tube by a distance between
about 3 millimeters and about 5 millimeters.

34. The chromatography cartridge as set forth in claim 32 wherein the
connector portion projects axially outward from the end of the tube by a distance between
about 6 millimeters and about 10 millimeters.

35. The chromatography cartridge as set forth in claim 29 wherein the connector portion projects axially outward from the end of the tube by a distance of about 2 millimeters.

36. The chromatography cartridge as set forth in claim 29 wherein the connector portion projects axially outward from the end of the tube by a distance of about 4 millimeters.

37. The chromatography cartridge as set forth in claim 27 wherein said end cap further comprises an opening in the connector portion for establishing fluid communication with the interior of the tube.

38. The chromatography cartridge as set forth in claim 37 wherein said opening comprises a conically shaped inlet section.

39. The chromatography cartridge as set forth in claim 37 wherein said opening comprises a female luer fitting section.

40. The chromatography cartridge as set forth in claim 27 wherein said tube has an annular region extending past the outer face of the end cap and deformed inwardly to retain the end cap in the tube.

41. The chromatography cartridge as set forth in claim 40 wherein said annular region is heat crimped and deformed inwardly to contact the end cap.

42. The chromatography cartridge as set forth in claim 27 further comprising a frit received in the tube for contacting the chromatography media.

43. A chromatography cartridge set comprising:
a first tube,
a second tube,
end caps defining a closed interior space of the first and second tube,
5 a coupler for connecting the first and second tubes in end to end relation, the
coupler being adapted for fluid communication therethrough between the first and second
tubes.

44. A chromatography cartridge set as set forth in claim 43 wherein said
end caps comprise an outer face having a connector portion formed therein adapted for
plug in connection to a chromatography stand.

45. A chromatography cartridge set as set forth in claim 43 wherein said
coupler comprises a nipple for fluid communication between said first and second tubes.

46. A chromatography cartridge set as set forth in claim 45 wherein said
coupler comprises an O-ring adapted for sealing connection between said first and second
tubes.

47. A chromatography cartridge set as set forth in claim 43 wherein said
coupler comprises a connector having at least one male fitting for fluid connection
between said first and second tubes.

48. A chromatography cartridge set as set forth in claim 46 wherein said
end caps comprise an opening for fluid communication with interior of a respective tube,
said opening adapted for compressing said O-ring to form a sealing connection.

49. A chromatography cartridge set as set forth in claim 43 wherein said
tubes contain chromatography media in said closed interior space.

50. A chromatography cartridge set as set forth in claim 49 wherein said first or second tube contains a sample to be separated by fluid flow through the chromatography set.

51. A chromatography cartridge set as set forth in claim 43 further comprising a sleeve for supporting and aligning said tubes in end to end relation.

52. A chromatography cartridge set as set forth in claim 51 wherein said sleeve comprises a generally hollow tube for receiving the first and second tube.

53. A chromatography cartridge set as set forth in claim 52 wherein said sleeve has an inner shoulder for contact with said first and second tubes.

54. A chromatography cartridge set as set forth in claim 43 wherein said first and second tubes have at least one of a different diameter and a different length.

55. A chromatography cartridge set as set forth in claim 43 further comprising a third tube and a fourth tube, said third and fourth tubes having at least one of a different diameter and a different length than the first and second tubes.

56. A method for operating a chromatography column in a liquid chromatography stand comprising first and second chromatography cartridges having substantially the same configuration, each cartridge having a pair of opposed end caps defining an inlet and outlet of the cartridge and containing chromatography media therebetween, each cartridge being capable of independent use in the chromatography column, said method comprising the steps of:

coupling said first and second chromatography cartridge in generally end-to-end relation for the transfer of fluid between the first and second cartridge;

introducing a sample to a carrier solvent for fluid flow through the apparatus;

passing a carrier solvent through said first chromatography cartridge;
passing the solvent through said second chromatography cartridge;
collecting the separated sample downstream of the second cartridge.

57. A method as set forth in claim 56 further comprising the step of preloading said first cartridge with a sample prior to said connecting step.

58. A method as set forth in claim 56 wherein said coupling step comprises stacking said first and second cartridges.

59. A method as set forth in claim 58 further comprising the step of removing one of said first and second stacked cartridges and using a single cartridge in the chromatography stand.

60. A method as set forth in claim 56 wherein said coupling step comprises connecting a coupler between said first and second cartridges.

61. A method for loading a sample in a chromatography cartridge for purification in a chromatography stand, said method comprising the steps of:

attaching said chromatography cartridge to a vacuum loading chamber;

introducing a sample to the chromatography cartridge,

applying a solvent to the chromatography cartridge,

removing the chromatography cartridge from the vacuum loading chamber prior to full separation of the sample.

62. A method as set forth in claim 61 further comprising the step of connecting a filter to the chromatography cartridge.

63. A method as set forth in claim 62 further comprising the step of passing a sample through said filter prior to said introducing a sample step.

64. A method as set forth in claim 62 wherein said connecting step comprises stacking a filter on said chromatography cartridge.

65. A method as set forth in claim 61 wherein said applying step comprises filling the cartridge with a column volume of solvent.

66. A method as set forth in claim 61 wherein said removing step occurs prior to solvent being discharged from the chromatography column.

67. A method as set forth in claim 61 wherein said introducing step comprises connecting a solid phase extraction module containing the sample to the chromatography cartridge.

68. A method as set forth in claim 61 wherein said introducing step comprises connecting a syringe containing the sample to the chromatography cartridge.

69. A flushing connector for use in a chromatography stand having a first and second platen, said flushing connector comprising:

a body adapted to be received between said first and second platen, said body having a first end, a second end and a passage from the first end to the second end for the flow of fluid therethrough,

at least one of the first and second ends of the body having an outer face comprising a connector portion adapted for plug-in connection to the stand to positively locate the body relative to the stand and place the body in fluid connection with the stand.

70. The flushing connector as set forth in claim 69 further comprising at least one insert received in the passage.

71. The flushing connector as set forth in claim 70 wherein said at least one insert comprises a frit received in the passage of the body.

72. The flushing connector as set forth in claim 70 wherein said at least one insert comprises a first frit received in the passage at the first end of the body and a second frit received in the passage at the second end of the body.

73. The flushing connector as set forth in claim 69 wherein said connector portion is adapted to locate the body upon said plug-in connection.

74. The flushing connector as set forth in claim 73 wherein said connector portion projects axially outward from said outer face.

75. The flushing connector as set forth in claim 74 wherein the connector portion is a cylindrical projection.

76. The flushing connector as set forth in claim 75 wherein the connector portion has a diameter of approximately 25 millimeters.

77. The flushing connector as set forth in claim 75 wherein said connector portion projects axially outward from the outer face of the body by approximately 8 mm.